Ryland Huntley
12 OLD BOND STREET, BATH. Tel. 4332
RADIO & TELEVISION

beolit
teena 610 fm

SERVICE MANUAL

PRINTED IN DENMARK

A/S BANG & OLUFSEN PRODUKTIONSSELSKAB
STRUER Telephone (0.78) 5 51 22* - Telex 4289 - Cable Adress Bangolu

TECHNICAL DATA

AM Aerial: Ferrite aerial for both bands. Auto connector socket for external aerial. Ferrite aerial is cut out on both LW and MW when the aerial button is depressed.

Auto Mounting Bracket: See page 16.

Battery Drain: Low volume: approx. 20 mA.
50 mW output power: approx. 50 mA.
Max. output: approx. 200 mA.

Dimensions: 10.7 in. wide, 7.2 in. high, 3.6 in. deep (270 mm × 183 mm × 91 mm).

Dry Cells: Six 1.5-volt cells.

External Speaker: 3.2 — 15 Ω, connector-socket switching; both speakers can operate together.

FM Aerial: Telescoping dipole. Auto connector socket for external aerial.

Gram. Connection: Not provided – see page 14.

Oscil. Radication, FM: Attenuated according to present German standards.

Output Power: 1.4 watts max.

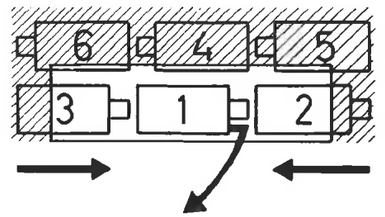
Tape Recorder Connnection: Not provided — see page 14.

Wave Bands: LW 940 — 2040 m 320 — 147 kc/s
MW 188 — 545 - 1600 — 550 -
FM 87.5 — 104 Mc/s

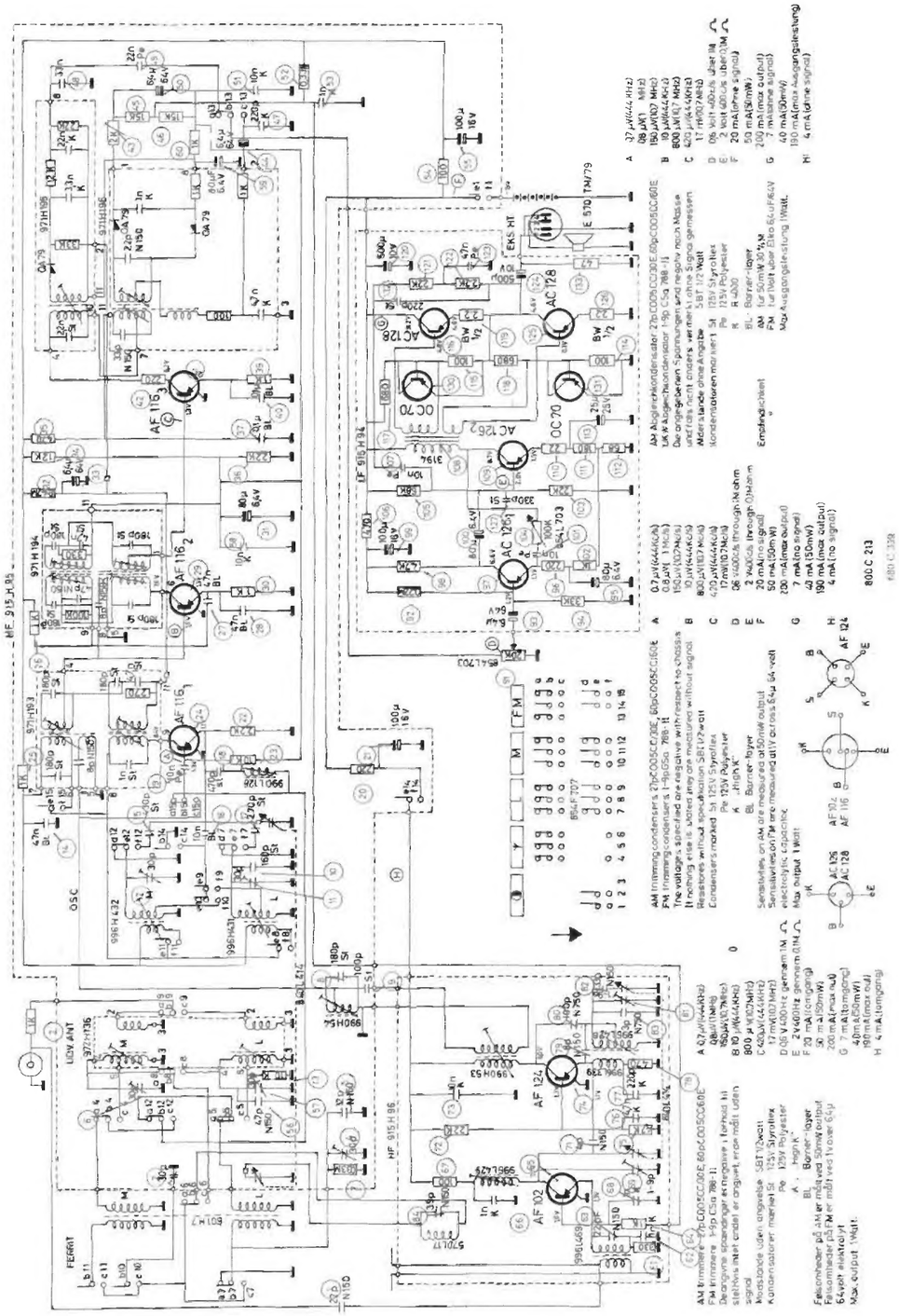
Weight: 5.5 lbs (2.5 kg) inclusive of dry cells.

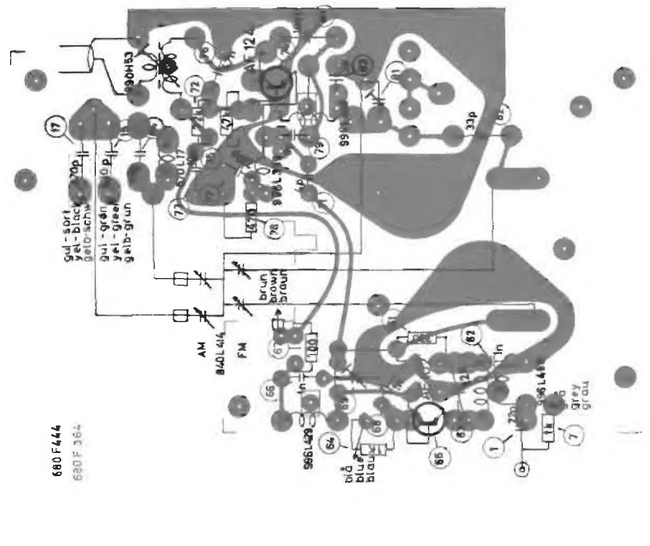
Battery Replacement

Remove the bottom plate and take out the dry cells, proceeding in the order indicated. New cells should preferably be inserted in the reverse order (6 — 1). Note polarity. All cells should be replaced at the same time.
Battery voltage is checked at point F in the circuit diagram.

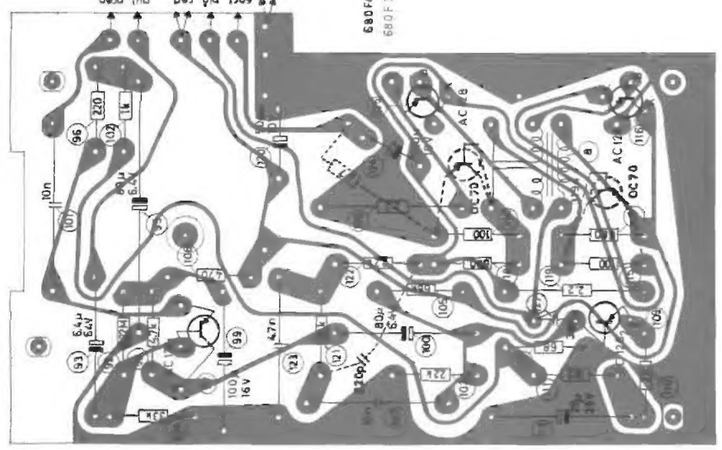


CIRCUIT DIAGRAM OF BEOLIT TEENA 610 FM



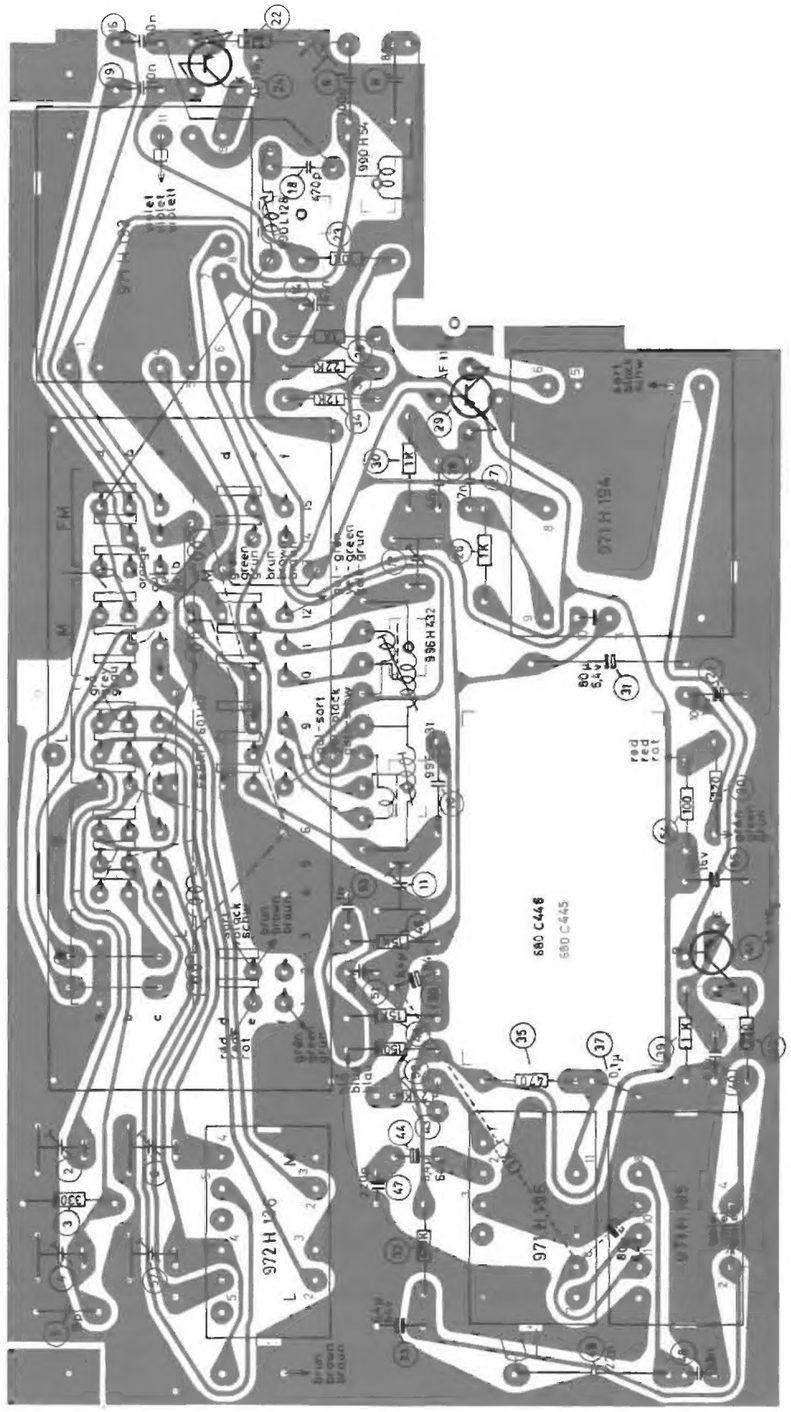


P.W. plade komplet 915 H 96
P.W. board 915 H 96 complete
Gedruckte Schaltung 915 H 96 komplett



PW-plade komplet 915 H 94
PW-board 915 H 94 complete
Gedruckte Schaltung 915 H 94 komplett

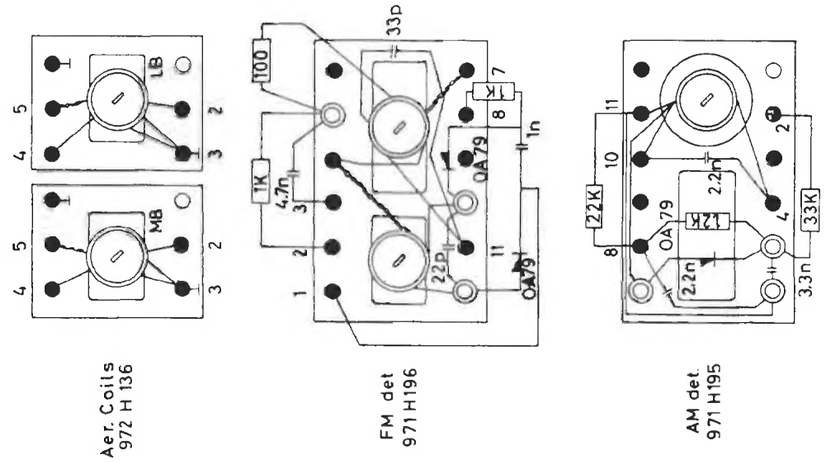
LOCATION OF COMPONENTS ON PW BOARD

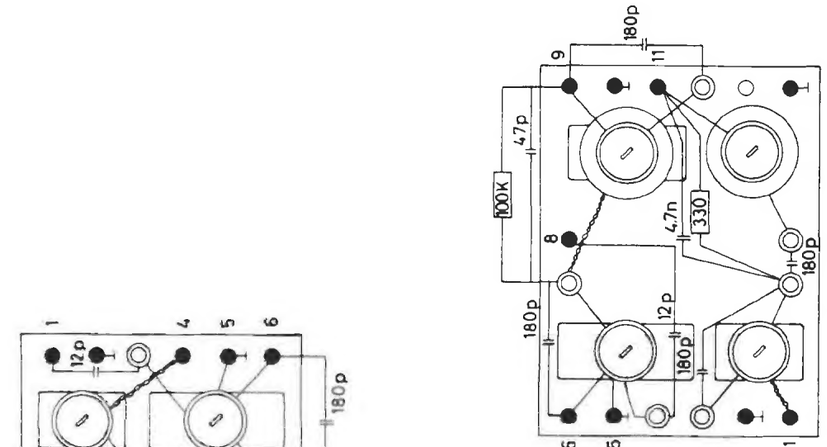


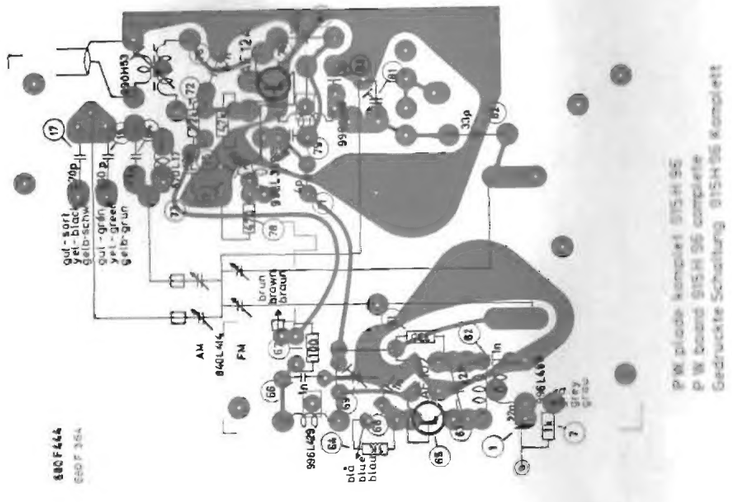
PW-plade komplet 915H95

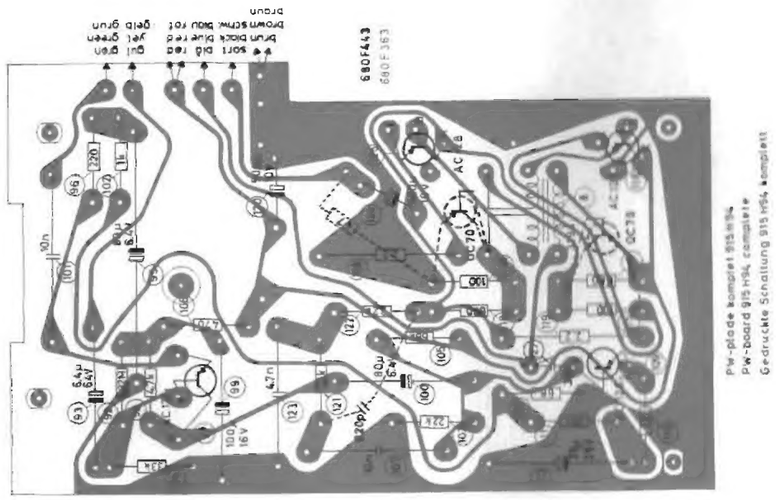
PW board 915H95 complete

IF TRANSFORMER WIRING DIAGRAMS






680F444
680F364
P.W. plade komplet 915H 95
P.W. board 915H 95 complete
Gedruckte Schaltung 915H 95 komplett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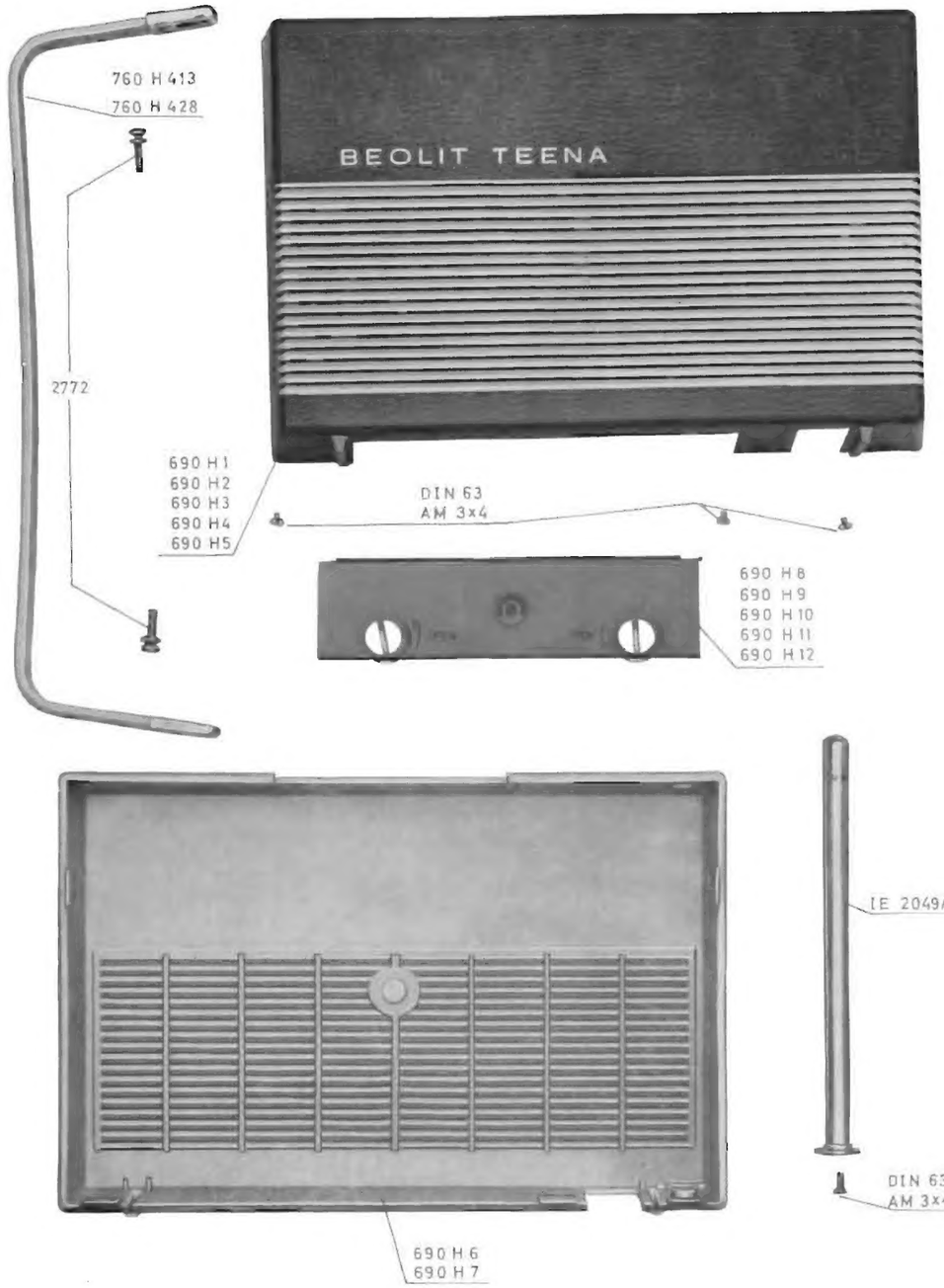
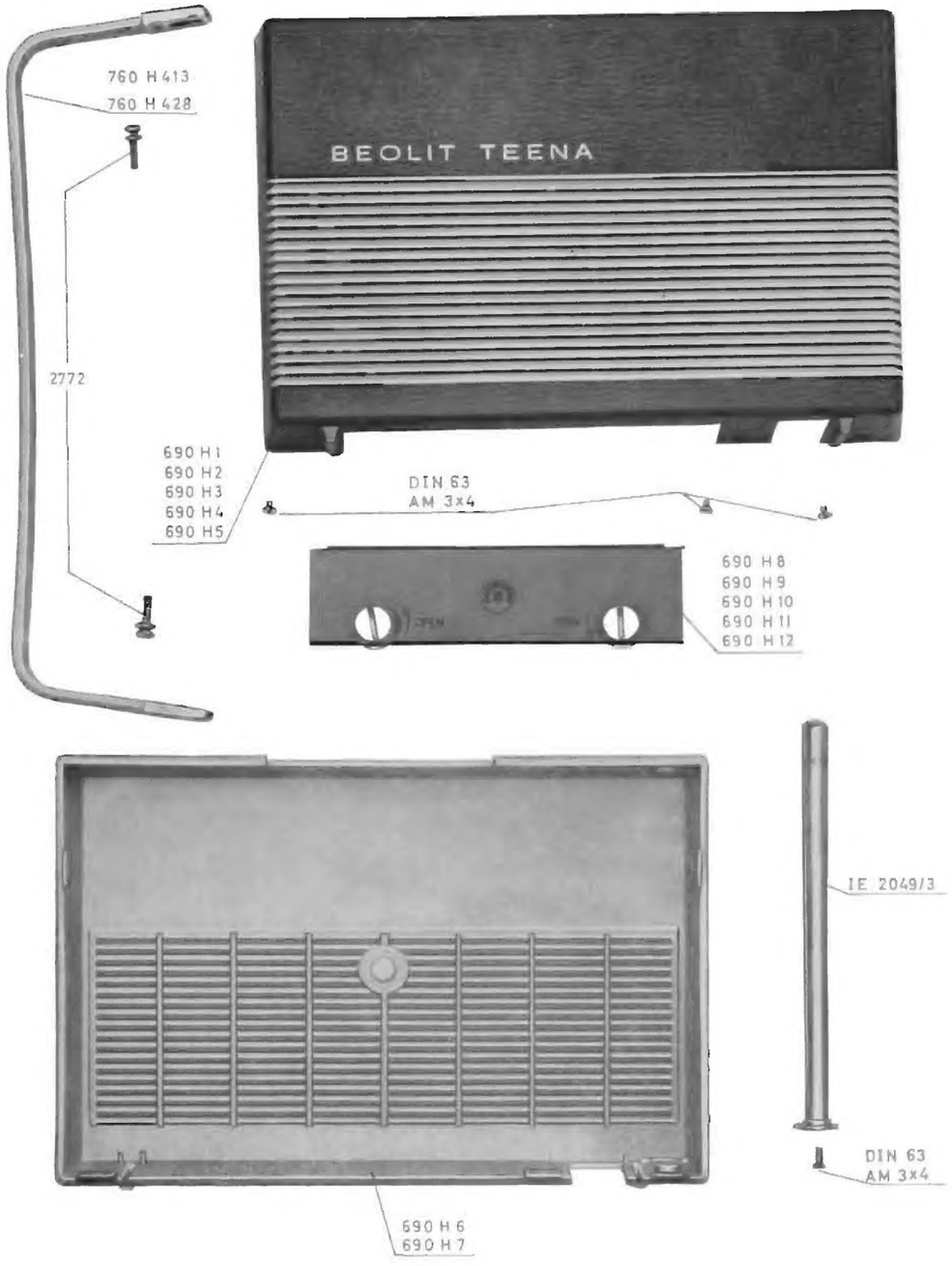
680F363
Pw-plade komplet 915H94
Pw-board 915 H94 complete
Gedruckte Schaltung 915 H94 komplett


760 H 413
760 H 428
2772
BEOLIT TEENA
690 H1
690 H2
690 H3
690 H4
690 H5
DIN 63
AM 3x4
690 H 8
690 H 9
690 H 10
690 H 11
690 H 12
690 H 6
690 H 7
IE 2049/3
DIN 63
AM 3x4


760 H 413
760 H 428
2772
BEOLIT TEENA
690 H1
690 H2
690 H3
690 H4
690 H5
DIN 63
AM 3x4
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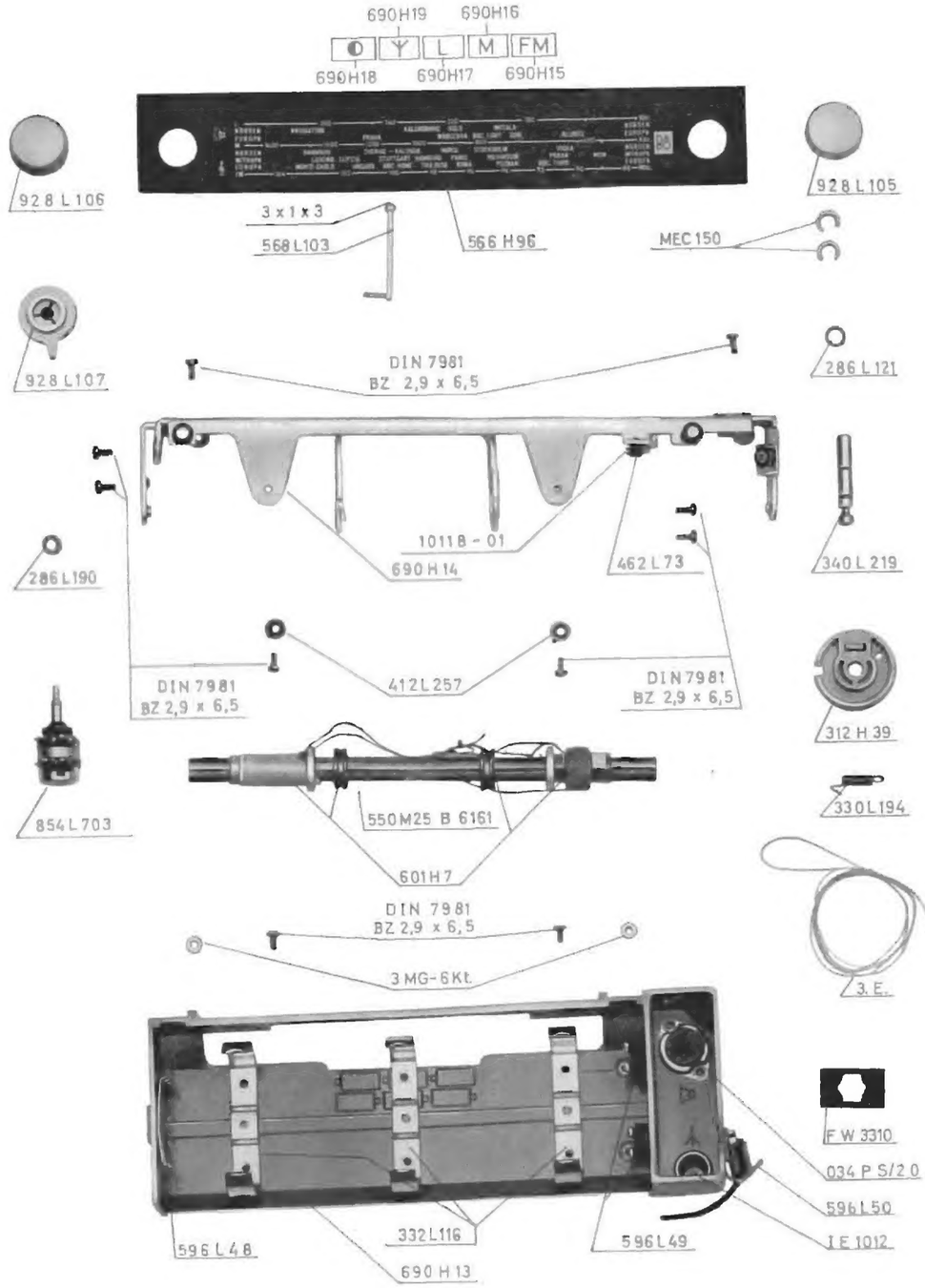
690 H6
690 H7
IE 2049/3
DIN 63
AM 3x4


690H19
690H16
690H18
690H17
690H15
O
Y
L
M
FM
928 L 106
928 L 105
3 x 1 x 3
568 L 103
566 H 96
MEC 150
928 L 107
DIN 7981
BZ 2,9 x 6,5
286 L 121
286 L 190
10118 - 01
690 H 14
462 L 73
340 L 219
DIN 7981
BZ 2,9 x 6,5
412 L 257
DIN 7981
BZ 2,9 x 6,5
312 H 39
854 L 703
550 M25 B 6161
330 L 194
601 H 7
DIN 7981
BZ 2,9 x 6,5
3 MG-6 Kt.
3. E.
F W 3310
034 P S/2 0
596 L 50
IE 1012
596 L 48
332 L 116
690 H 13
596 L 49

PARTS LIST large components and units

Aluminium chassis:	complete	690 H 14
*Cabinet, front section complete with speaker grille and dial glass:	auto green	690 H 1
* —	horizon blue	690 H 2
* —	oxide red	690 H 3
* —	pastel grey	690 H 4
* —	black	690 H 5
*Cabinet, rear section with fittings:	pastel grey	690 H 6
* —	sky grey	690 H 7
*Connector plugs:	aerial	10075
* —	speaker	S 34
*Connector sockets:	aerial	IE 1012
* —	speaker	034 PS/2 O
*Cord wheel:		312 H 39
Dial pointer:		568 L 103
Drive shaft:		340 L 219
*Ferrite rod:	less coils	550 M 25 B 6161
* —	complete with coils	601 H 7
*FM aerial:		IE 2049/3
*Handle:	pastel grey	760 H 413
* —	black	760 H 428
Housing for dry cells:	complete	690 H 13
*Knobs:	tuning	928 L 105
* —	volume	928 L 106
* —	tone	928 L 107
*Lid for dry cells:	auto green	690 H 8
* —	horizon blue	690 H 9
* —	oxide red	690 H 10
* —	pastel grey	690 H 11
* —	black	690 H 12
*Potentiometer:	Treble and volume	854 L 703
*Screw for handle:	4 mm metric thread - 12 mm	2772
*Speaker:		E 570 TM/79
Spring for dial drive:		330 L 194
Station dial:		566 H 96

For replacement of pin for cord pulley please order Type 466 L 73, which is provided with thread, and nut for same, 2 mm.
For sundry small parts (screws, washers etc.) see pages 6 — 7.

Auto Mounting Bracket: (separate accessory) 920 H 6

**PW Board, RF Section, complete: 915 H 96*

Ferrite tubing:		56.061.69/3 B
Resistors:	special type, No. 61 in circuit diagram	330 UBT
— — — -	67 - — —	100 UBT
— — — -	78 - — —	470 UBT
Rubber for tuning capacitor:		411 L 36
Tuning capacitor:		840 L 414

Parts List to be Continued on page 9

The parts marked with a * are prefered spare parts

Parts List Continued from page 8

Angle:		245 H 486
Coils:	FM aerial	996 L 469
—	RF	996 L 429
—	mixer	996 L 339
—	oscillator	996 L 428
—	IF	990 H 53
—	series trap	570 L 17
Screen:	FM radiation	535 H 474
Screw for tuning capacitor:		AM 3 × 10 DIN 84
— - — — :		286 L 185
*Transistors:	FM — RF	AF 102
* —	FM mixer	AF 124
Trimmer:		788/II-9 pF
Washer for tuning capacitor:		M 3 × 10 SZ-DIN 933

**PW Board, IF Section, complete: 915 H 95*

Band switch:	push-button assembly	854 F 707
*Buttons for push-button assembly:	FM	690 H 15
* —	M	690 H 16
* —	L	690 H 17
* —	on/off switch	690 H 18
* —	aerial	690 H 19
Coils:	AM series trap	990 L 128
—	FM IF sec.	990 H 54
	LW oscillator	996 H 431
—	MW oscillator	996 H 432
*Diodes:	AM detector	OA 79
* —	FM detector	two OA 79
Ferrite tubing:		56.061.69/3B
IF transformers and screened coils:	LW and MW aerial	972 H 136
—	1st IF	971 H 193
—	2nd IF	971 H 194
—	AM detector	971 H 195
—	FM detector	971 H 196
Potentiometer:	FM detector	1 — 8096
Socket for el. cap.:	small	506 H 101
—	large	506 H 102
*Transistors:	AM mixer	AF 116
* —	1st IF	AF 116
* —	2nd IF	AF 116

**PW Board, AF Section, complete: 915 H 94*

Screen:	output transistors	760 L 417
*Transformer:	driver	ST 3194
*Transistors:	AF stage	AC 126
* —	AF driver	AC 126
* —	AF stabilization	2×OC 70
* —	output	2 × AC 128

For other electrical components refer to circuit diagram on page 2

The parts marked with a * are prefered spare parts

DESCRIPTION

The BEOLIT TEENA 610 FM is a combined AM/FM receiver. Except for the ferrite aerial it is built on PW boards. On LW and MW, the ferrite aerial may be cut out by means of the aerial push-button, which also cuts in aerial coils for use with an external aerial. These aerial coils are housed in screened cans. The external-aerial connector socket is common to AM and FM. The FM tuner is built on a separate PW board on which the tuning capacitor is mounted. This board also carries the padding capacitors for the AM bands. Signals from the aerial are applied, via the input transformer, to the emitter of AF 102, which operates as an RF amplifier. AF 124 operates as a self-excited mixer. The output of the AF 102 is applied to the AF 124 emitter, which also receives oscillator voltage via a capacitor. The collector of AF 124 connects to the primary of the first intermediate-frequency transformer. The coil is tuned by 100 pF, which connects to the tap on the oscillator coil; the tap is very close to the chassis end of the coil. The secondary of the transformer is located on the IF board. Coupling between the two boards is taken care of by a link and a capacitor. AF 116_1 operates as a self-excited AM mixer and as an FM intermediate-frequency amplifier. The switch connects the base to the FM tuner and the AM aerial coils, respectively. The 444-kc/s series trap is connected between base and emitter. A 10-nF capacitor connects the emitter to a tap on the tuned oscillator coil. When the switch is in the FM position, the capacitor is connected to chassis ("earth") potential; the collector goes to the second FM IF transformer and through the oscillator feedback coil to the first AM IF transformer. AF 116_2 and AF 116_3 are IF amplifiers.

The AM signal rectifier is an OA 79 diode, which also supplies AGC control bias. The entire AM detector circuit is raised 1.4 volt above chassis potential, and the AGC bias moves in the positive direction or towards chassis potential. The bias voltage is applied, via the filter consisting of 33 K Ω and 6.4 uF and through the 270 Ω resistor across part of the secondary of 1st AM IF, to the base of AF 116_2, thereby reducing the emitter current of that transistor and hence its gain.

The FM detector is a ratio detector using two OA 79 diodes. The series resistor of one diode has been made variable in order to make it possible to obtain perfect symmetry. The FM detector also supplies FM AGC bias. The FM detector is likewise raised −1.4 volts above chassis, and the AGC bias likewise moves towards chassis potential. The AGC bias is applied, via 1 K Ω and 1 nF, to the base of AF 102. In FM operation, the three IF transistors have a fixed bias of −1.4 volts.

The AF signal is applied, via the potentiometer, to AC 126_1, which is resistance coupled to the AC 126_2 driver stage. Negative feedback voltage is taken from the speaker terminals and applied to the base of AC 126_2 via a network. An external speaker is connected by means of a standard (DIN) plug-and-socket connection, and the plug may be inserted in two different ways, determining whether or no the built-in speaker will operate together with the external speaker. A pick-up or tape recorder may be

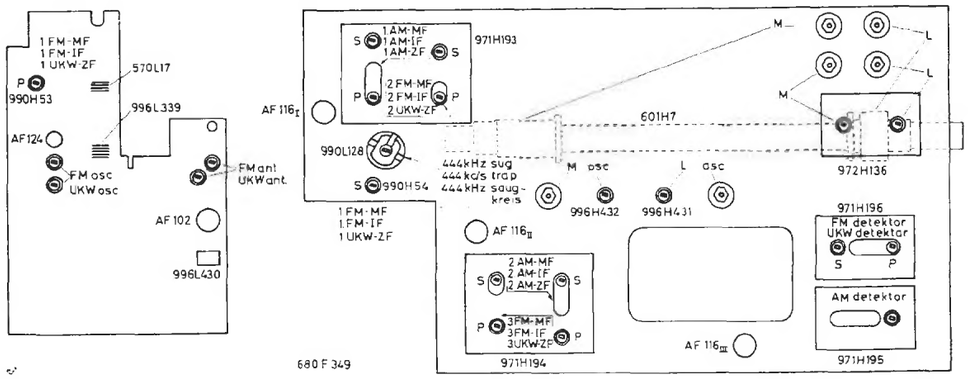
connected after the external speaker socket has been rewired as shown on page 14. If the plug is turned one way, the connection from the detector to the AF amplifier will be opened, and a signal applied from outside will be amplified by the AF amplifier. If the plug is turned over 180 degrees, the connector socket will provide a signal for recording on tape. The receiver will operate normally when the plug is inserted this way.

Owing to increasing distortion as the dry cells lose their voltage, the base voltage for the output transistors has been stabilized. This has been accomplished as follows: The two voltage dividers for the base bias voltages for AC 128 consist of 680 Ω+100 Ω with an OC 70 transistor connected as a diode across the 100 Ω resistor.

NOTES:

444 kc/s IF Alignment

The receiver should be tuned to a frequency near the middle of the MW band and a signal from the alignment oscillograph applied at point A (the base of AF 116$_I$) through a 0.1 μF capacitor, with the iron core of the IF series trap screwed all the way out.

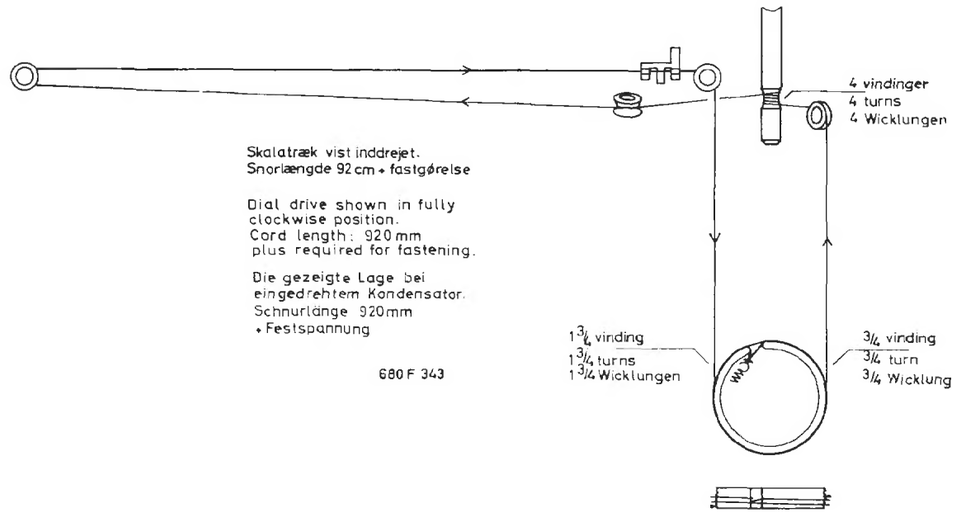


The signal is measured at the top of the potentiometer, and the circuits should be tuned for maximum response and symmetrical curve-form. The IF signal should thereafter be applied through the aerial connector socket and the IF series trap tuned for maximum attenuation.

Alignment Points

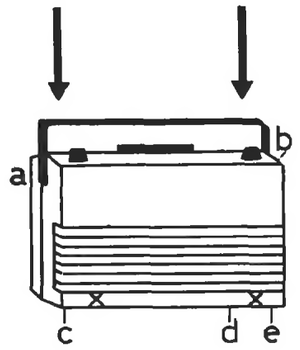
When the tuning capacitor is at maximum capacitance, the pointer should be in line with the mark on the LW scale at the right-hand side of the dial.
Ferrite-aerial sensitivities as measured in a screened room with a signal from a loop aerial, at 50 mW output:

LW: 160 and 272 kc/s, sensitivity 450 and 224 μV/m
MW: 584 - 1484 kc/s, — 250 and 125 μV/m

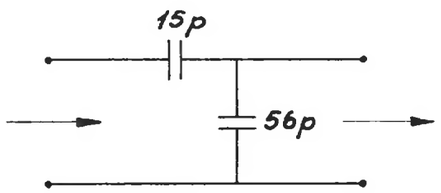


Disassembling the Receiver

1. Take of the handle by pressing lightly in the direction of the arrows.
2. Remove the three control knobs by pulling them off.
3. Remove screws a, b, c, d and e.
4. The cabinet may now be disassembled and the two nuts behind the dry cells removed.



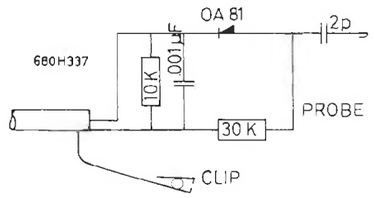
It is important that the receiver be aligned in the sequence LW-MW with the built-in speaker mounted in place.
For alignment on an external aerial, the signal should be applied through a dummy aerial consisting of two capacitors as shown in the sketch below.



Sensitivity as measured through dummy aerial, at 50 mW output:
LW: 160 and 272 kc/s, sensitivity 90 and 35.5 μV
MW: 584 and 1484 kc/s, — 100 and 45 μv
The locations of coils and trimmers appear from the layout sketch on page 12.

FM Alignment

A sweep generator should be used for aligning the 10.7 Mc/s intermediate frequency. A signal near det middle of the FM band, say at 96 Mc/s, should be applied through the external-aerial connector socket, and the oscillograph should be connected to the collector of AF 116$_3$ through a probe with a built-in diode (see sketch below). The circuits should be tuned for maximum response and symmetrical curve-form. For aligning the discriminator, the oscillograph should be connected to the top of the potentiometer without the probe, and the circuits should be tuned for symmetrical curveform and best noise suppression by means of the semi-variable 2 KΩ potentiometer.
The oscillator is adjusted by means of the trimmer and the iron core in the FM unit, after which the RF circuits are tuned for maximum response; see layout sketch on page 12.



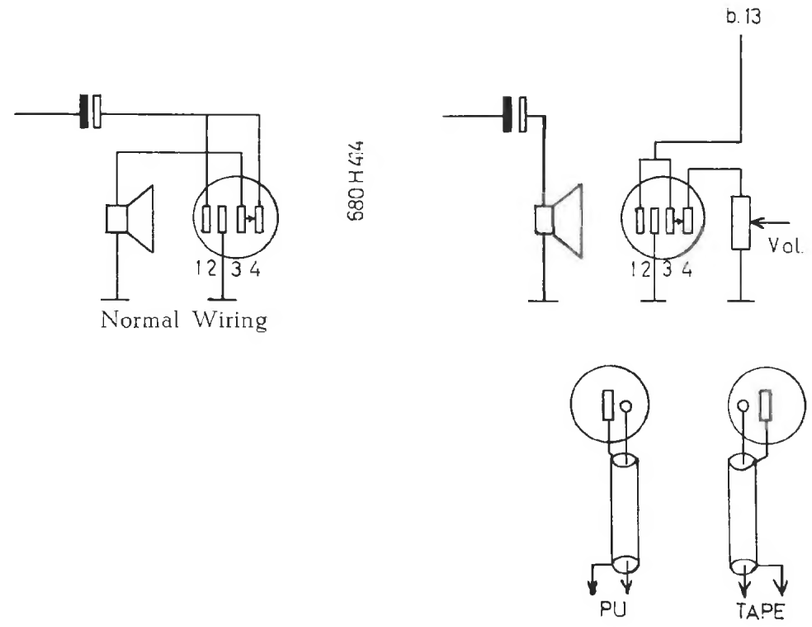
Sensitivities

92 Mc/s: 4 μV for 50 mW output power measured across a 5 Ω resistor instead of the speaker. 26 dB signal/noise ratio at 5 μV. Signal/noise ratio measured with tone control at max. bass response.

Fault Finding

may be based on the voltages, currents and sensitivities indicated in the circuit diagram. It should be noted, however, that RF and IF sensitivities can only be measured with a signal generator having low output impedance. The connection between the signal generator chassis and the receiver chassis should always be made before the RF signal lead is connected.
The best way of checking AM oscillator functioning is by means of an oscillograph connected to the emitter of AF 116$_1$, at which point the voltage should be approx. 0.3 — 0.7 volt peak-to-peak. A check on the functioning of the FM oscillator may be obtained by connecting a 10 pF capacitor in series with an OA 81 diode between the emitter of AF 115 and chassis, with the diode connected to chassis. When the oscillator is operating, approx. 0.15 — 0.5 volt can be measured across the diode, using a vacuum-tube voltmeter.

Rewiring the External-speaker Connector Socket for Use as Tape Recorder and Pick-up Socket



With the speaker socket rewired as shown in the sketch at the right, the plug, when inserted one way, will open the connection between the detector and the AF amplifier, admitting the signal from the pick-up. With the plug inserted the other way, a signal will be available for the tape recorder and the receiver will operate normally.

Type 920 H 6 Auto Mounting Bracket

The auto mounting bracket should be installed in the car below the instrument board or wherever space conditions permit. 6 screws, 6 spring washers, and 1 clamp are supplied for the installation (Figs. 1 and 2).

The mounting bracket has connector sockets for aerial and external speaker. (Fig. 3).

As supplied by the factory, the speaker socket is wired so that both the built-in speaker and the external speaker will operate when the receiver is mounted on the bracket.

If only the external speaker is operate, remove the two screws holding the strap with the speaker socket, turn the strap through 180 degrees and then screw it into position again.

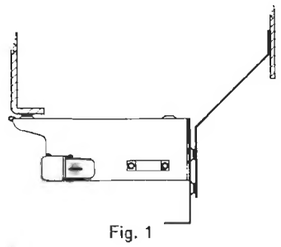


Fig. 1

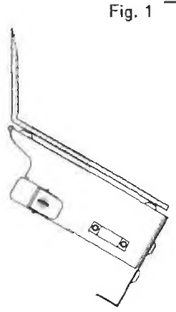


Fig. 2

Installing the Receiver

1. Detach the handle by strikning lightly in the direction of the arrow (Fig. 4).
2. Open the locking devices.
3. Place the receiver with the speaker grille facing downwards. Lift it upwards against the upper part of the mounting bracket and slide it back so that the two pins to which the handle was fastened slide into matching notches on the mounting bracket (Fig. 5).
4. Close the locking devices down around the pins, thereby pulling the receiver firmly into position (Fig. 5).
5. Pushing from below, slide the handle upwards into the two straps on the sides of the mounting bracket (Fig. 5).

It is assumed that the car is equipped with auto aerial and noise suppression.

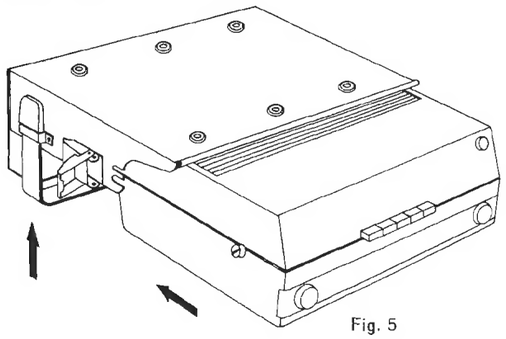


Fig. 5

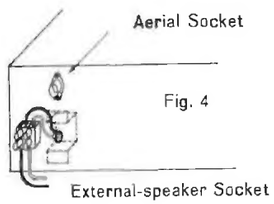


Fig. 4

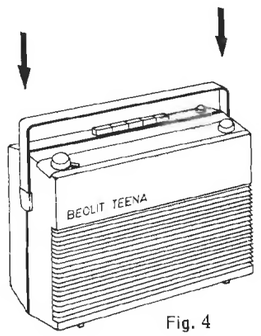


Fig. 4